

Serial No. 09/601,434

Docket No. 1998/F 009 (9931*9)

Remarks

The applicants respectfully request reconsideration in view of the amendment and the following remarks. Support for amended claim 21 is found in the specification at page 15, lines 13-15 and at page. No new matter has been added.

Claims 21-32 are rejected under 35 U.S.C. 112, second paragraph for being incomplete for omitting essential elements and relationships. Applicants respectfully traverse. Amended claims 21 and 27 are believed to more particularly recite the essential elements of the claimed laser and methods of producing laser emissions and to more particularly recite the functional relationship between the elements. It is respectfully requested that the indefiniteness rejection be reconsidered and withdrawn.

Claims 21-32 are rejected as obvious. For the reasons that follow, it is urged that new claims 21-32 are not obvious over the cited references.

The claims were rejected over U.S. Patent 5,568,417 ("Furuki") in view of U.S. Patent 4,026,705 ("Crivello") (claims 21, and 27), further in view of US Patent 5,989,737 ("Xie") or U.S. Patent 3,958,815 ("Poot") (claims 22-26 and 28-32). Furuki is relied upon as showing in Figure 17 a substrate, a first electrode, an organic layer and a second electrode. The Office Action asserts that Furuki teaches the invention but fails to teach a solid spiro dye layer.

Applicants respectfully disagree. The invention requires a laser and a method of producing laser emissions. Furuki, however, does not report a laser or a laser effect. Furuki discloses a fluorescent device comprising an organic dye thin film, a pair of electrodes disposed to apply pressure to the organic dye thin film and a light source generating fluorescence by exciting the organic dye thin film. Furuki, however, does not

Serial No. 09/601,434

Docket No. 1998/F 009 (9931*9)

report a laser effect. Although Furuki uses solid fluorescent dyes and devices that could cause lasing, it does not disclose use of any fluorescent materials that are able to lase. In particular, at column 7, lines 57-60, Furuki shows a device having a solid dye that is very far away from lasing: "Moreover, the fluorescent dye molecules often emit very weak or even no fluorescent [sic] when they are formed in solid form in spite [sic] that they generally emit fluorescence strongly in a liquid state."

In contrast, claims 21-32 require a laser having a light source, such as a laser or a flash lamp, that is capable of producing stimulated emission of the organic solid laser dye (claims 21-26) or a method of producing a laser emission by subjecting an organic solid laser dye to a light source to excite the dye to emit radiation (claims 27-32). Because Furuki struggles to even have light emitting from solid dye molecules, one skilled in the art would not find it obvious to create a laser from a solid organic dye using the Furuki teachings.

In fact, the failure of Furuki to make a laser with the materials described shows the inventiveness of the present invention. The present inventors discovered that a particular class of compounds are functional as solid laser dyes with narrow band width emission. Furuki is evidence that many fluorescent organic dyes cannot be used in this manner.

In the obviousness rejection, Furuki was combined with Crivello. Crivello was cited as teaching a solid form of a spiro compound. But Crivello, like Furuki, does not teach about lasers. Crivello teaches epoxy compositions that can be cured with visible radiant energy based on the use of certain organic dyes in combination with diarylhalonium salts. The Office Action referred to column 6, lines 7-16 as disclosing

Serial No. 09/601,434

Docket No. 1998/F 009 (9931*9)

solid spiro compounds. Yet this passage refers to possible monomers that can be used in the epoxy resins. The monomers disclosed here are "cyclic ethers" that can be, amongst other things, "oxygen containing spiro compounds". Such spiro compounds are monomers, like the other items in the list, that polymerize via ring opening and then no longer exist as spiro compounds. They become part of the polymer, which is cured into a solid by visible light. Thus, Crivello does not teach solid forms of spiro dyes.

Furthermore, the spiro compounds of Crivello are clearly distinguishable from the present claims. The spiro compounds of the present invention do not contain oxygen and are not polymerized. Furthermore, Crivello does not mention spiro compounds containing conjugated systems, which is required in the spiro compounds recited in the present claims. Thus, for these reasons, it is urged that Furuki in view of Crivello do not render the present claims obvious.

Claims 22-26 and 28-32 are rejected as obvious over Furuki in view of Crivello and further in view of Xie. Xie was cited in the Office Action as teaching spirobifluorene. Xie teaches an organic electroluminescent device having an organic layer of a mixture of aromatic amine and a polycyclic aromatic hydrocarbon compound. Spirobifluorene is listed with many other structurally unrelated compounds as illustrative examples of polycarbocyclic aromatic hydrocarbon compounds that can be combined with the aromatic amine compounds to stabilize the thin film morphology. One would not look to a teaching of general compounds to stabilize a polymer layer to discover a solid dye that can be used in a laser. Furthermore, Xie teaches spirobifluorene only the context of creating an electroluminescent device. No teaching is given for suitable laser materials or how a laser effect can be created. Furthermore, Xie reports devices that

Serial No. 09/601,434

Docket No. 1998/F 009 (9931*9)

produce a brightness of below 1150 Cd/ m², which is far below any chance of lasing. Thus, one skilled in the art would not be lead to select spirobifluorene from Xie's list of different polycarboxylic aromatic hydrocarbons to use as a solid laser dye. Also, because none of the cited references discusses lasers or producing a laser effect from a solid spiro compound, one skilled in the art would not find Applicants' claimed laser and method of producing coherent laser emission obvious.

Claims 22-26 and 28-32 are rejected as obvious over Furuki in view of Crivello and further in view of Poot. Poot was cited as teaching substituted spiro compounds. Poot concerns a pressure-recording process in which a methine dye is produced by contacting a dye precursor with an acid with the aid of pressure. Poot does not disclose lasers or even electroluminescence. Because Poot concerns pressure-sensitive recording sheets, one skilled in the art looking for a solid organic laser dye would not look to Poot. The fields are too different.

Furthermore, the Office Action relies upon column 2, lines 22-28 as teaching substituted spiros. Yet at this citation, Poot discloses "acid-sensitive spiro-dipyrar" that, similar to Crivello, is an unstable or reactive spiro compound that reacts upon pressure with other reactants to produce a visual image. In contrast, the solid spiro compounds of the present invention are stable and do not require another chemical reactant to produce a desired effect. Additionally, no conjugated system is mentioned in Poot. In contrast, each of the pending claims of the present invention have a spiro compound with conjugated systems. Thus, for these reasons, one of skill in the art would not find it obvious to substitute known laser materials with solid conjugated spiro compounds in a laser based on the teachings of Poot.

Serial No. 09/601,434

Docket No. 1998/F 009 (9931*9)

Furthermore, none of the three cited references teaches a laser. In contrast, claims 21-32 require a laser having a light source, such as a laser or a flash lamp, that is capable of producing stimulated emission of the organic solid laser dye (claims 21-26) or a method of producing a laser emission by subjecting an organic solid laser dye to a light source to excite the dye to emit radiation (claims 27-32). Because the cited references do not teach or suggest a laser or producing a laser emission with a solid spiro dye, the claims are non-obvious over the cited references.

In sum, in view of the above remarks and amendments, it is respectfully urged that the rejections be reconsidered and withdrawn.

A petition for extension of time (three months) is attached along with a check for the fee due. No additional fees are believed due. If the undersigned is mistaken, however, please charge any fees required by the filing of this paper or credit any overpayment to Deposit Account No. 03-2775.

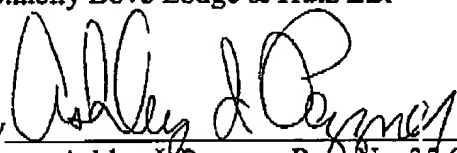
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Respectfully submitted,

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